Intertek | Architectural Testing

NFRC 102-2010 THERMAL PERFORMANCE
TEST REPORT

Rendered to:

CR LAURENCE CO., INC.

SERIES/MODEL: StormWall XL Curtain Wall (Low-E)
TYPE: Glazed Wall Systems (Site-built)

Summary of Results	
Standardized Thermal Transmittance (U-Factor)	0.40
Unit Size	78-3/4" x 78-3/4" (2000 mm x 2000 mm) (Model Size)
Layer 1	1/4" Oldcastle SunGlass VT (e=0.021*, #2) Tempered
Gap 1	0.53" Gap, Technoform TGI Spacer (TS-D), 90% Argon-Filled*
Layer 2	0.53" (1/4" Clear / 0.075" PVB / 1/4" Clear) Laminated

Reference must be made to Report No. C2682.03-116-46, dated 10/14/16 for complete test specimen description and data.

NFRC 102-2010 THERMAL PERFORMANCE TEST REPORT

Rendered to:

CR LAURENCE CO., INC.
2503 East Vernon Avenue
Loas Angeles, California 90058

Report Number:	C2682.03-116-46
Test Date:	11/07/12
Report Date:	10/14/16

Test Sample Identification:

Series/Model: StormWall XL Curtain Wall (Low-E)

Type: Glazed Wall Systems (Site-built)

Overall Size: 78-3/4" x 78-3/4" (2000 mm x 2000 mm) (Model Size)
NFRC Standard Size: 78.7" x 78.7" (2000 mm wide x 2000 mm high)

Test Sample Submitted by: Oldcastle BuildingEnvelope - Terrell, Texas

Test Sample Submitted for: Validation for Initial Certification (Production Line Unit)
no Plant Qualification

This report is a reissue of the original Report No. C2682.01-116-46. This report is reissued in the name of CR Laurence Co., Inc. through written authorization of Oldcastle BuildingEnvelope.

Test Procedure: U-factor tests were performed in a Guarded Hot Box in accordance with NFRC 102-2010, *Procedure for Measuring the Steady-State Thermal Transmittance of Fenestration Systems* .

Test Results Summary:

Standardized U-factor (U_{st}): 0.40 Btu/hr·ft²·F CTS Method

Test Sample Description:

CONSTRUCTION	Frame
Size (in.)	78-3/4" x 78-3/4"
Daylight Opening (in.)	35-5/8" x 73-3/4" (x2)
CORNERS	Butted
Fasteners	Screws
Sealant	Yes
MATERIAL	AT (0.25")
Color Exterior	Clear
Finish Exterior	Anodized
Color Interior	Clear
Finish Interior	Anodized
GLAZING METHOD	Exterior Pressure Plate (Screwed 9" O.C.)

Glazing Information:

Layer 1	1/4" Oldcastle SunGlass VT (e=0.021*, #2) Tempered
Gap 1	0.53" Gap, Technoform TGI Spacer (TS-D), 90% Argon-Filled*
Layer 2	0.53" (1/4" Clear / 0.075" PVB / 1/4" Clear) Laminated
Gas Fill Method	Single-Probe Method*

**Stated per Client/Manufacturer*
N/A Non-Applicable
See Description Table Abbreviations

Test Sample Description: (Continued)

COMPONENTS			
	Type	**Quantity**	**Location**
WEATHERSTRIP			
	GP107 gasket	1 row	Frame at pressure plate
	GP117 gasket	1 row	Exterior glazing perimeter
	FG5185 gasket	1 row	Interior glazing perimeter
HARDWARE			
	Aluminum pressure plate	7	Four exterior horizontals, three exterior verticals
	Aluminum face cap	7	Four exterior horizontals, three exterior verticals
	(1.38" x 0.75") Wood blocks	6	Two per head and sill, one per jamb
DRAINAGE			
	(0.31") diameter weephole	4	Two per sill pressure plate

Thermal Transmittance (U-factor)

Measured Test Data

Heat Flows

1. Total Measured Input into Metering Box (Q_{total})	1331.90	Btu/hr
2. Surround Panel Heat Flow (Q_{sp})	49.82	Btu/hr
3. Surround Panel Thickness	8.00	inches
4. Surround Panel Conductance	0.0226	Btu/hr·ft²·F
5. Metering Box Wall Heat Flow (Q_{mb})	6.32	Btu/hr
6. EMF vs Heat Flow Equation (equivalent information)	0.0115*EMF + -0.017	
7. Flanking Loss Heat Flow (Q_{fl})	7.59	Btu/hr
8. Net Specimen Heat Loss (Q_s)	1268.17	Btu/hr

Areas

1. Test Specimen Projected Area (A_s)	43.07	ft²
2. Test Specimen Interior Total (3-D) Surface Area (A_h)	66.32	ft²
3. Test Specimen Exterior Total (3-D) Surface Area (A_c)	51.06	ft²
4. Metering Box Opening Area (A_{mb})	75.11	ft²
5. Metering Box Baffle Area (A_{bl})	70.84	ft²
6. Surround Panel Interior Exposed Area (A_{sp})	32.04	ft²

Test Conditions

1. Average Metering Room Air Temperature (t_h)	69.80	F
2. Average Cold Side Air Temperature (t_c)	-0.40	F
3. Average Guard/Environmental Air Temperature	71.26	F
4. Metering Room Average Relative Humidity	14.22	%
5. Metering Room Maximum Relative Humidity	14.48	%
6. Metering Room Minimum Relative Humidity	13.96	%
7. Measured Cold Side Wind Velocity (Perpendicular Flow)	12.66	mph
8. Measured Static Pressure Difference Across Test Specimen	0.00" ± 0.04"	H_2O

Average Surface Temperatures

1. Metering Room Surround Panel	68.50	F
2. Cold Side Surround Panel	-0.22	F

Results

1. Thermal Transmittance of Test Specimen (U_s)	0.42	Btu/hr·ft²·F
2. Standardized Thermal Transmittance of Test Specimen (U_{st})	0.40	Btu/hr·ft²·F

Thermal Transmittance (U-factor)

Calculated Test Data

CTS Method

1. Warm Side Emittance of Glass (e_1)	0.84	
2. Cold Side Emittance of Glass	0.84	
3. Warm Side Frame Emittance	0.80	
4. Cold Side Frame Emittance	0.80	
5. Warm Side Sash/Panel/Vent Emittance	N/A	
6. Cold Side Sash/Panel/Vent Emittance	N/A	
7. Warm Side Baffle Emittance (e_{b1})	0.92	
8. Equivalent Warm Side Surface Temperature	48.75	F
9. Equivalent Cold Side Surface Temperature	5.24	F
10. Warm Side Baffle Surface Temperature	68.76	F
11. Measured Warm Side Surface Conductance (h_h)	1.40	Btu/hr·ft^2·F
12. Measured Cold Side Surface Conductance (h_c)	5.22	Btu/hr·ft^2·F
13. Test Specimen Thermal Conductance (C_s)	0.68	Btu/hr·ft^2·F
14. Convection Coefficient (K_c)	0.32	Btu/(hr·ft^2·F$^{1.25}$)
15. Radiative Test Specimen Heat Flow (Q_{r1})	643.98	Btu/hr
16. Conductive Test Specimen Heat Flow (Q_{c1})	624.19	Btu/hr
17. Radiative Heat Flux of Test Specimen (q_{r1})	14.95	Btu/hr·ft^2·F
18. Convective Heat Flux of Test Specimen (q_{c1})	14.49	Btu/hr·ft^2·F
19. Standardized Warm Side Surface Conductance (h_{sth})	1.21	Btu/hr·ft^2·F
20. Standardized Cold Side Surface Conductance (h_{stc})	5.28	Btu/hr·ft^2·F
21. Standardized Thermal Transmittance (U_{st})	0.40	Btu/hr·ft^2·F

Test Duration

1. The environmental systems were started at 16:34 hours, 11/06/12.
2. The test parameters were considered stable for two consecutive four hour test periods from 22:04 hours, 11/06/12 to 06:04 hours, 11/07/12.
3. The thermal performance test results were derived from 02:04 hours, 11/07/12 to 06:04 hours, 11/07/12.

The reported Standardized Thermal Transmittance (Ust) was determined using CTS Method, per Section 8.2(A) of NFRC 102.

Glazing Deflection (in):

	Left Glazing	Right Glazing
Edge Gap Width	0.53	0.53
Estimated center gap width upon receipt of specimen in laboratory (after stabilization)	0.41	0.47
Center gap width at laboratory ambient conditions on day of testing	0.41	0.47
Center gap width at test conditions	0.38	0.44

Glass collapse determined using a digital glass and air space meter

The sample was inspected for the formation of frost or condensation, which may influence the surface temperature measurements. The sample showed no evidence of condensation/frost at the conclusion of the test.

"This test method does not include procedures to determine the heat flow due to either air movement through the specimen or solar radiation effects. As a consequence, the thermal transmittance results obtained do not reflect performances which may be expected from field installations due to not accounting for solar radiation, air leakage effects, and the thermal bridge effects that may occur due to the specific design and construction of the fenestration system opening. Therefore, it should be recognized that the thermal transmittance results obtained from this test method are for ideal laboratory conditions and should only be used for fenestration product comparisons and as input to thermal performance analyses which also include solar, air leakage and thermal bridge effects."

"Ratings included in this report are for submittal to an NFRC-licensed IA for certification purposes and are not meant to be used for labeling purposes. Only those values identified on a valid Certification Authorization Report (CAR) are to be used for labeling purposes."

The test sample was installed in a vertical orientation, the exterior of the specimen was exposed to the cold side. The direction of heat transfer was from the interior (warm side) to the exterior (cold side) of the specimen.

ANSI/NCSL Z540-2-1997 type B uncertainty for this test was 1.53%.

Required annual calibrations for the Architectural Testing Inc. 'thermal test chamber' (ICN 000001) in York, Pennsylvania were last conducted in May 2012 in accordance with Architectural Testing Inc. calibration procedures. A CTS Calibration verification was performed in June 2012. A Metering Box Wall Transducer and Surround Panel Flanking Loss Characterization was performed in June 2012.

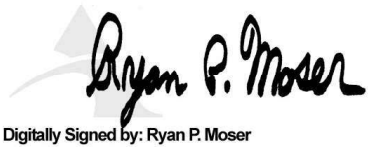
This report is a reissue of the original Report No. C2682.01-116-46. This report is reissued in the name of CR Laurence Co., Inc. through written authorization of Oldcastle BuildingEnvelope.

Architectural Testing will service this report for the entire test record retention period. Test records that are retained such as detailed drawings, datasheets, representative samples of test specimens, or other pertinent project documentation will be retained by Architectural Testing, Inc. for the entire test record retention period. The test record retention end date for this report is November 7, 2016.

Results obtained are tested values and were secured by using the designated test methods. This report does not constitute certification of this product nor an opinion or endorsement by this laboratory. It is the exclusive property of the client so named herein and relates only to the specimen(s) tested. This report may not be reproduced, except in full, without the written approval of Architectural Testing, Inc.

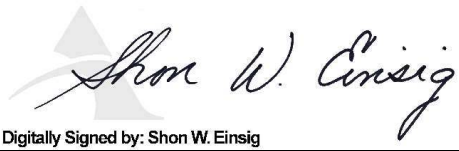
For ARCHITECTURAL TESTING, INC.

Tested By:



Ryan P. Moser
Technician

Reviewed By:



Shon W. Einsig
Senior Technician
Individual-In-Responsible-Charge

RPM:kmm
C2682.03-116-46

Attachments (pages): This report is complete only when all attachments listed are included.

Appendix-A:	Description Table Abbreviations (1)
Appendix-B:	CTS Calibration Data (1)
Appendix-C:	Surround Panel Wiring Diagram (1)
Appendix-D:	Baffle Wiring Diagram (1)
Appendix-E:	Submittal Form and Drawings (10)

Revision Log

Rev. #	Date	Page(s)	Revision(s)
.03R0	10/14/16	All	Original Report Issue - Reissue of Report No. C2682.01-116-46 in the name of CR Laurence Co., Inc.

Appendix A: Description Table Abbreviations

CODE	Frame / Sash Types
AI	Aluminum w/ Vinyl Inserts (Caps)
AL	Aluminum
AP	Aluminum w/ Thermal Breaks - Partial
AS	Aluminum w/ Steel Reinforcement
AT	Aluminum w/ Thermal Breaks - All Members (> 0.21")
AU	Aluminum Thermally Improved - All Members (0.062" - 0.209")
AV	Aluminum / Vinyl Composite
AW	Aluminum-clad Wood
FG	Fiberglass
PA	ABS Plastic w/ All Members Reinforced
PC	ABS Plastic-clad Aluminum
PF	ABS Plastic w/ Foam-filled Insulation
PH	ABS Plastic w/ Horizontal Members Reinforced
PI	ABS Plastic w/ Reinforcement - Interlock
PL	ABS Plastic
PP	ABS Plastic w/ Reinforcement - Partial
PV	ABS Plastic w/ Vertical Members Reinforced
PW	ABS Plastic-clad Wood
ST	Steel
VA	Vinyl w/ All Members Reinforced
VC	Vinyl-clad Aluminum
VF	Vinyl w/ Foam-filled Insulation
VH	Vinyl w/ Horizontal Members Reinforced
VI	Vinyl w/ Reinforcement - Interlock
VP	Vinyl w/ Reinforcement - Partial
VV	Vinyl w/ Vertical Members Reinforced
VW	Vinyl-clad Wood
VY	Vinyl
WA	Aluminum / Wood composite
WD	Wood
WV	Vinyl / Wood composite
WF	Fiberglass/Wood Combination
WC	Composite/Wood Composite (Shaped vinyl/wood composite members)
CW	Copper Clad Wood
CO	Vinyl/Wood Composite Material

CODE	Spacer Types (See sealant)
A1	Aluminum
A2	Aluminum (Thermally-broken)
A3	Aluminum-reinforced Polymer
A4	Aluminum / Wood
A5	Aluminum-reinforced Butyl (Swiggle)
A6	Aluminum / Foam / Aluminum
A7	Aluminum U-shaped
A8	Aluminum-Butyl (Corrugated) (Duraseal)
ER	EPDM Reinforced Butyl
FG	Fiberglass
GL	Glass
OF	Organic Foam
P1	Duralite
PU	Polyurethane Foam
SU	Stainless Steel, U-shaped
CU	Coated Steel, U-shaped (Intercept)
S2	Steel (Thermally-broken)
S3	Steel / Foam / Steel
S5	Steel-reinforced Butyl
S6	Steel U-channel w/ Thermal Cap
SS	Stainless Steel
CS	Coated Steel
TP	Thermo-plastic
WD	Wood
ZE	Elastomeric Silicone Foam
ZF	Silicone Foam
ZS	Silicone / Steel
N	Not Applicable
TS	Thermo-plastic w/ stainless steel substrate

CODE	Tint Codes
AZ	Azurlite
BL	Blue
BZ	Bronze
CL	Clear
EV	Evergreen
GD	Gold
GR	Green
GY	Gray
LE	Low 'e' Coating
OT	Other (use comment field)
RC	Solar or Reflective Coating
RG	Roller Shades between glazing
RS	Silver (reflective coating)
SF	Suspended Polyester Film
SR	Silver
BG	Blinds between the Glazing
DV	Dynamic Glazing-Variable
DY	Dynamic Glazing-NonVariable

CODE	Gap Fill Codes
AIR	Air
AR2	Argon/Krypton Mixture
AR3	Argon / Krypton / Air
ARG	Argon/Air
CO2	Carbon Dioxide
KRY	Krypton/Air
SF6	Sulfur Hexaflouride
XE2	Xenon/Krypton/Air
XE3	Xenon/Argon/Air
XEN	Xenon/Air
N	Not Applicable

DOOR DETAILS	
N	Not Applicable
CODE	Door Type
EM	Embossed
FL	Flush
LF	Full Lite
LH	1/2 - Lite
LQ	1/4 - Lite
LT	3/4 - Lite
RP	Raised Panel
CODE	Skin
AL	Aluminum
FG	Fiberglass
GS	Galvanized Steel
ST	Steel
WD	Wood
VY	Vinyl
CODE	Panel
FG	Fiberglass
PL	Plastic
WP	Wood - Plywood
WS	Wood - Solid
CODE	Sub-Structure
GS	Galvanized Steel
ST	Steel
WD	Wood
VY	Vinyl
CODE	Core Fill
CH	Cellular - Honeycomb
EP	Expanded Polystyrene
PI	Polyisocyanurate
PU	Polyurethane
WP	Wood - Plywood
WS	Wood - Solid
XP	Extruded Polystyrene

CODE	Spacer Sealant
D	Dual Seal Spacer System
S	Single Seal Spacer System

CODE	Grid Description
N	No Muntins
G	Grids between glass
S	Simulated Divided Lites
T	True Muntins

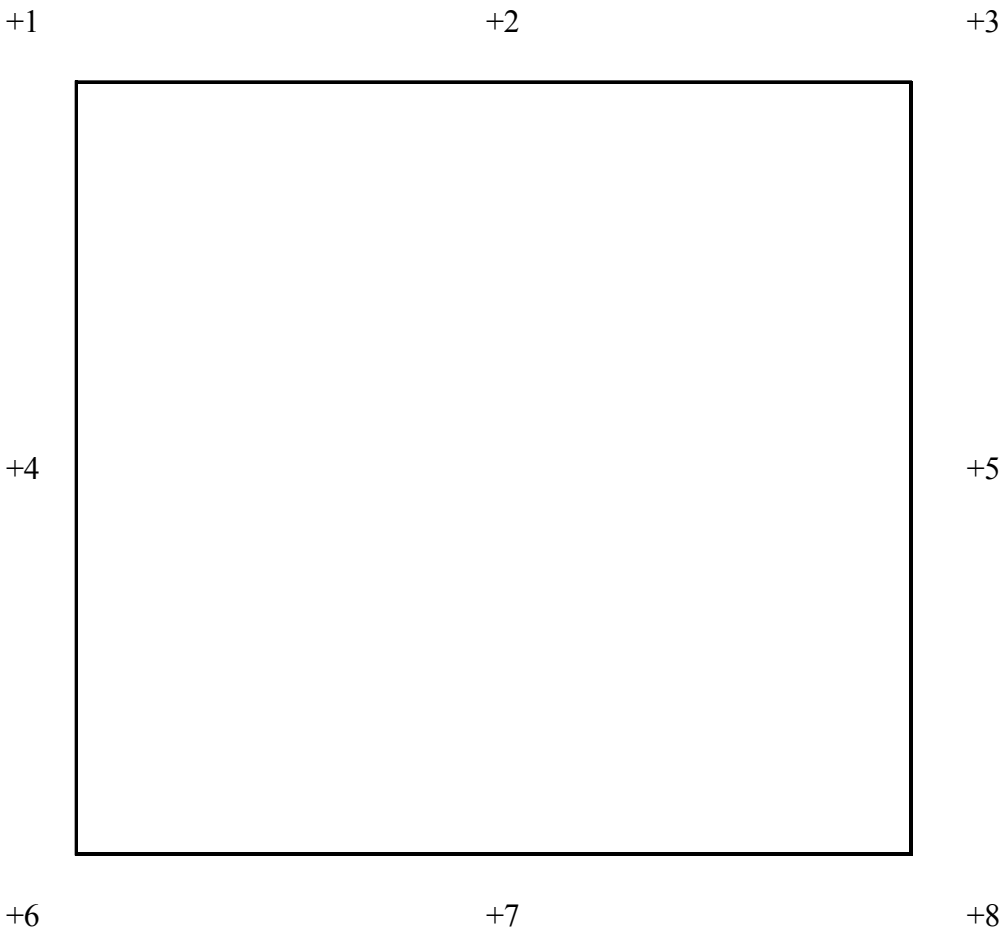
CODE	Grid Size Codes
	Blank for no grids
0.75	Grids < 1"
1.5	Grids >= 1"

CODE	Thermal Breaks
F	Foam
U	Urethane
V	Vinyl
FB	Fiberglass
O	Other
AB	ABS
NE	Neoprene
AI	Air
N	Not Applicable
P	Polyamide

Appendix B: CTS Calibration Data

1.	CTS Test Date	06/05/12	
2.	CTS Size	43.06	ft^2
3.	CTS Glass/Core Conductance	0.40	$Btu/hr \cdot ft^2 \cdot F$
4.	Warm Side Air Temperature	69.81	F
5.	Cold Side Air Temperature	-0.40	F
6.	Warm Side Average Surface Temperature	54.59	F
7.	Cold Side Average Surface Temperature	3.52	F
8.	Convection Coefficient (K_c)	0.32	$Btu/(hr \cdot ft^2 \cdot F^{1.25})$
9.	Measured Cold Side Surface Conductance (h_c)	5.22	$Btu/hr \cdot ft^2 \cdot F$
10.	Measured Thermal Transmittance	0.30	$Btu/hr \cdot ft^2 \cdot F$

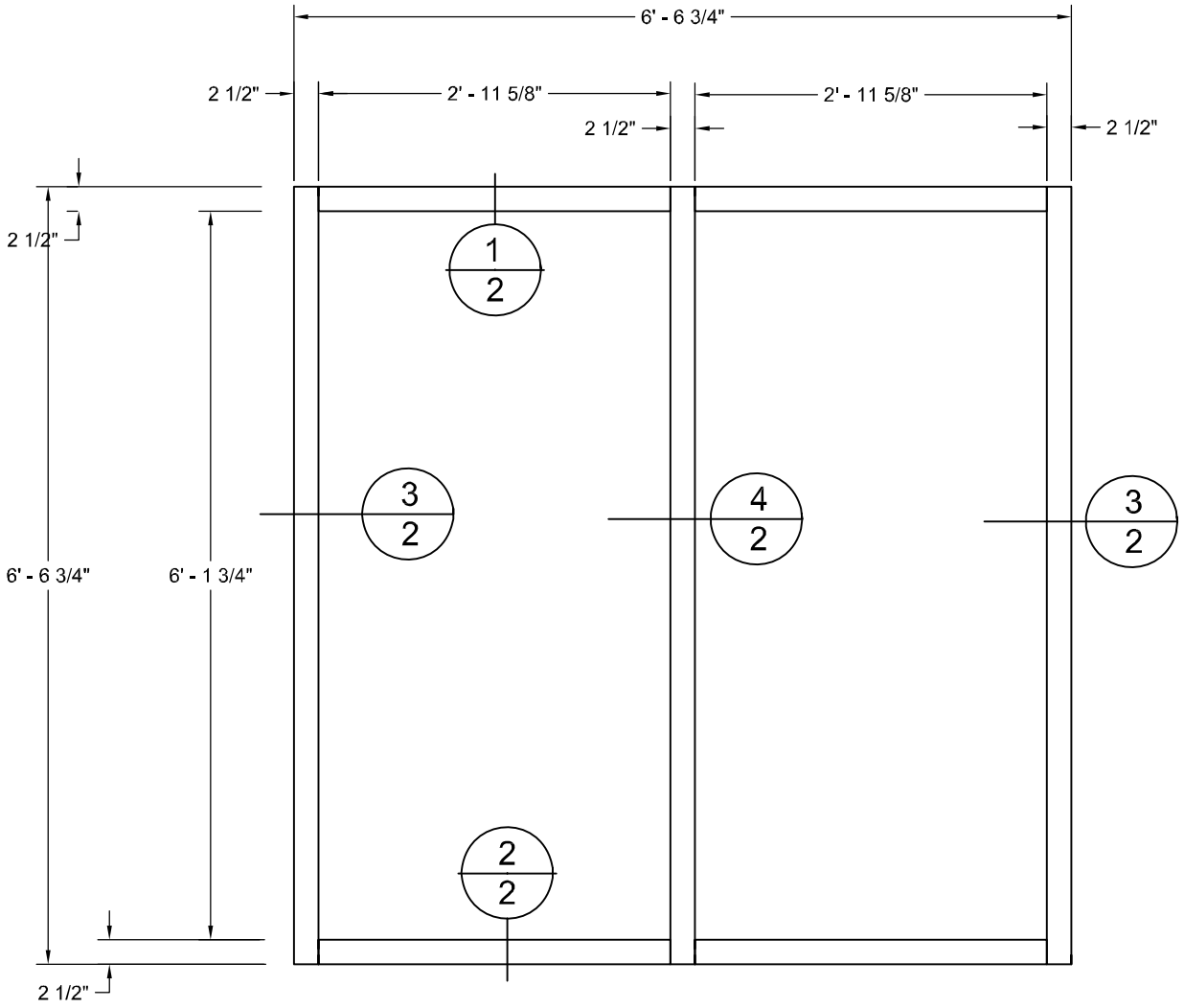
Appendix C: Surround Panel Wiring Diagram



Appendix D: Baffle Wiring Diagram

+1	+2	+3	+4	+5	+6
+7	+8	+9	+10	+11	+12
+13	+14	+15	+16	+17	+18
+19	+20	+21	+22	+23	+24
+25	+26	+27	+28	+29	+30

Appendix E: Submittal Form and Drawings



GENERAL TEST INFORMATION

AAMA 507 SIMULATIONS
AAMA 1503
NFRC 100
NFRC 100, 200, 500 SIMULATIONS

GLAZING SCHEDULE

GLASS COMPOSITION	MANUFACTURER NAME
1 5/16" STORMGLASS INSULATED GLASS CONSISTING OF 1/4" TEMP - 1/2" AIR SPACE - 1/4" H.S. .075 INTERLAYER - 1/4" H.S.	VANCEVA STORMGLASS

BILL OF MATERIAL

QTY	PART NO.	DESCRIPTION	LENGTH	NOTES
EXTRUSIONS				
	XL500-BP	Vertical/Jamb	78 3/4"	
	XL162-BP	Pressure Plate	78 3/4"	
	XL110-BP	Face Cap	78 3/4"	
	XL500-BP	Mullion	35 5/8"	
	XL162-BP	Pressure Plate	35 3/8"	
	XL110-BP	Face Cap	35 9/16"	

ACCESSORIES	
XLSB-2102	Setting Block
XLF-009	#14 x 1 1/2" HH
XLC-325	#12 - 14 x 1 1/2" HWH Elco Drill Flex
XLF-118	#10 x 1" PFH
XLB-183-01	Shear Block
XLG-117	Exterior Gasket
XLG-107	Isolator Gasket
XLG-5185	Interior Spacer Gasket

C.R.LAURENCE CO.
2503 E. Vernon Avenue, Los Angeles, CA 90058-1897
PH (800)-421-6144 FX: 800-587-7501
www.crlaurence.com

DRAWN BY: CH | APPROVED BY: | SCALE: FULL SIZE | DATE: 07/06/16 | EXTRUSION BASE PART NO.: XL

PART DESCRIPTION: STORMWALL XL ELEVATION | DWG #: ELEVATION

BRAND: US ALUMINUM

NOTES: THERMAL TEST DRAWINGS

REV	DESCRIPTION	DATE	APPD

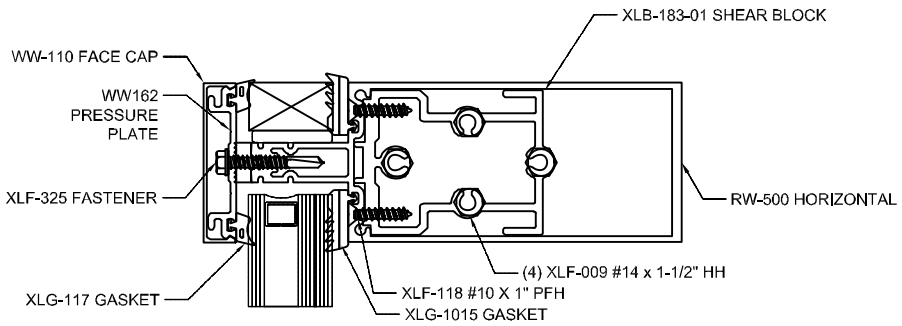
UNLESS OTHERWISE SPECIFIED:
ANSI/B4.1-2009 TOLERANCES FOR
ALUMINUM EXTRUSIONS APPLY

UNSPECIFIED CORNER RAD: IN.
UNSPECIFIED WALL THICKNESS: IN.

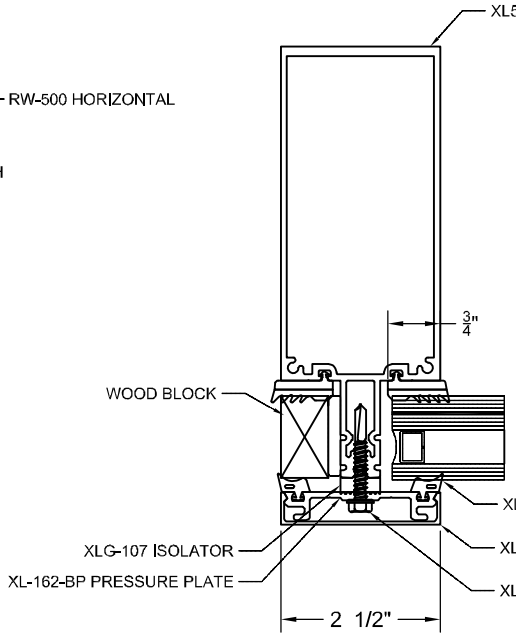
IDENTIFIES CRITICAL CHARACTERISTICS FOR CRL INSPECTION

IDENTIFIES EXPOSED AREA

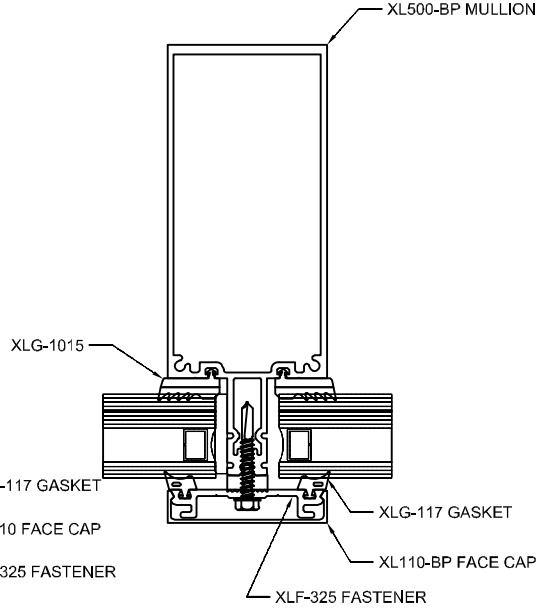
ALLOY & TEMPER: 6063-T6 | SQ. IN.
ESTIMATED AREA: | LB
ESTIMATED WEIGHT / FT: | IN.
ESTIMATED PERIMETER: | IN. | OUT_PER: | IN.
EXP/PAINTED PER: | IN.
CLASS: | CIRC. E. SIZE: | IN.
SECTION PROPERTIES: IN.^4 | IN.^3
IN.^4 | IN.^3



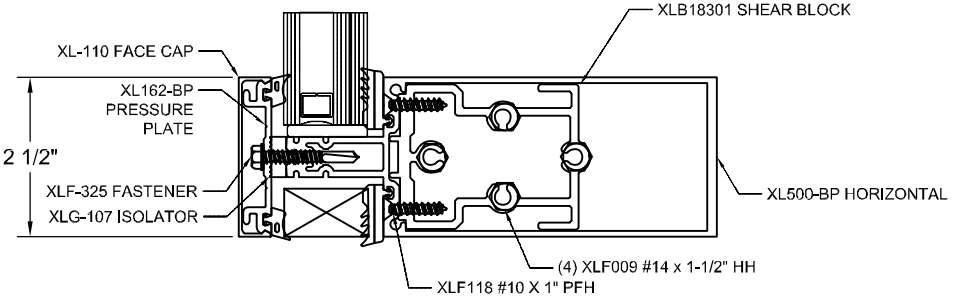
1 HORIZONTAL



3 JAMB



4 MULLION



2 HORIZONTAL

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DRAWN BY: CH
APPROVED BY:
SCALE: FULL SIZE
DATE: 07/06/16
EXTRUSION BASE PART NO: XL

PART DESCRIPTION: STORMWALL XL CROSS SECTIONS
BRAND: US ALUMINUM
NOTES: THERMAL TEST DRAWINGS
PAGE #:

REV	DESCRIPTION	DATE	APPD

THE DRAWING AND THE DESIGN SHOWN THEREON IS THE PROPERTY OF C.R.LAURENCE CO., INC. AND USE OR COPIES THEREOF CANNOT BE MADE WITHOUT WRITTEN CONSENT.

UNLESS OTHERWISE SPECIFIED: ANSI H35.2-2007 TOLERANCES FOR ALUMINUM EXTRUSIONS APPLY
UNSPECIFIED CORNER RAD: IN.
UNSPECIFIED WALL THICKNESS: IN.

IDENTIFIES CRITICAL CHARACTERISTICS FOR CRL INSPECTION
IDENTIFIES EXPOSED AREA

ALLOY & TEMPER: 6063-T6
ESTIMATED AREA: 2.08 SQ. IN.
ESTIMATED WEIGHT / FT: 2.85 LB
ESTIMATED PERIMETER: IN.
EXP PAINTED PER: IN. OUT_PER: IN.
CLASS: CIRCLE SIZE: IN.
SECTION PROPERTIES:
Ix: IN.4 Sx: IN.3
Iy: IN.4 Sy: IN.3